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JOANELLIA LUNDI SP. NOV. (CRUSTACEA: MALACOSTRACA) FROM THE MISSISSIPPIAN HEATH SHALE OF CENTRAL MONTANA

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Abstract. **Joanellia lundi** is described from the Heath Shale of Montana. The material represents a poorly sclerotized aenigmacarid associated with the syncaridan *Squillites spinosus*. It is the first occurrence of the genus *Joanellia* in North America.

Schram and Schram (1974) redescribed the syncarid malacostracan, *Squillites spinosus* Scott, 1938, from a black paper shale near the top of the Heath Shale, based on material found by Dr. Richard Lund of Adelphi University. Associated with *Squillites* in the Heath is a biota of leaf fragments encrusted with *Spirorbis*, conchostracan crustaceans, an aenigmacarid aeschronectidan (Malacostraca: Hoplocarida), and vertebrates (xenacanth sharks, acanthodian, and paleoniscoids). The associated fauna and stratigraphy of the Heath Shale are related in detail in Schram and Schram (1974).

The aenigmacarid aeschronectidan of the Heath Shale is described here. The material is plentiful but poorly preserved and comes from two localities in Fergus County, Montana: most specimens from sec. 28, T. 14 N, R 20 E, 1.2 km [=2 miles] south and 3.7 km [=6 miles] east of Heath; and some from T. 14 N, R. 19 E, 1.4 km [=2¼ miles] south of Heath. The material is deposited in the Field Museum of Natural History, Chicago (numbers prefixed PE) and the Carnegie Museum of Natural History, Pittsburg (numbers prefixed CM).

Discussion

The association of the aenigmacarid, *Joanellia lundi*, with the syncaridan, *Squillites spinosus*, is noteworthy. The associated faunas of the Heath Shale and general regional lithology indicate the Heath represents a lagoonal setting (R. D. Norby, *personal communication*). This is another instance in the Paleozoic when an aenigmacarid–syncaridan association in a lagoonal setting is recorded. The other is in the Upper Pennsylvanian, Madera Formation, of New Mexico (Schram and Schram, 1979) where *Aenigmacaris minima* is found with the syncarid *Uronectes kinniensis*. Thus, there seems to be a distinctive Late Paleozoic lagoonal fauna of crustaceans akin to what is seen in nearshore marine and coal measure chronofaunas (Schram, *in press*).

This is also the first occurrence of the genus *Joanellia* in North America. It was previously only known from the Lower Viséan of Britain (Schram, 1979). Interestingly, the earlier occurrence is in the entirely different faunal setting of a nearshore marine habitat.

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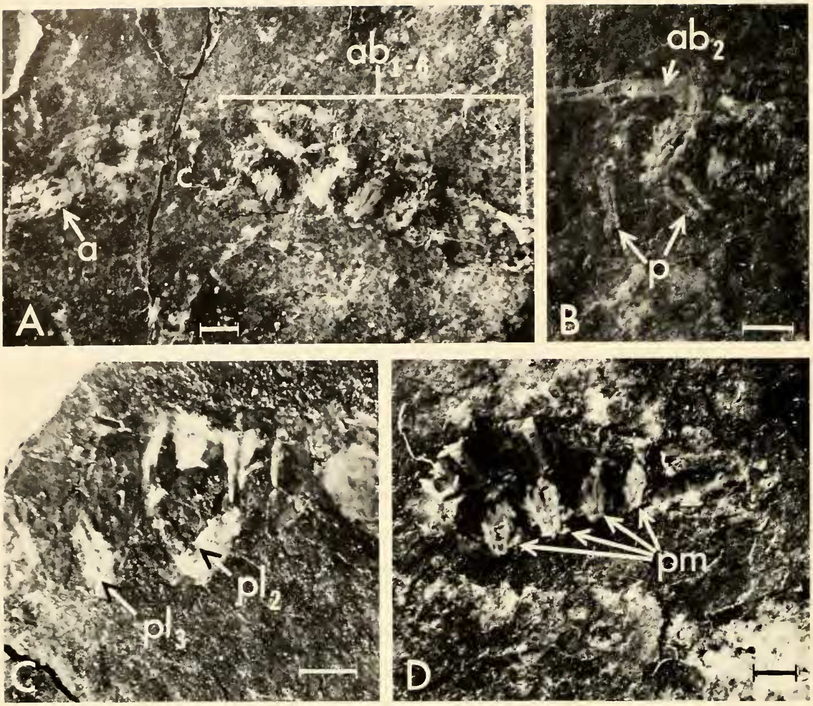

FIG. 1. ***Joanellia lundi*** sp. nov. (A) PE 18383, holotype. (B) PE 18382, anterior abdomen with stenopodous pleopods. (C) PE 18384, anterior of abdomen with pleomere pleura. (D) PE 18373, preserved remnants of pleopod muscles. a—antenna, ab—abdominal segments, p—pleopods, pl—pleomere pleura, pm—pleopod muscles, PE—specimens deposited at the Field Museum of Natural History, Chicago. Scales = 1 mm.

SYSTEMATICS

Class MALACOSTRACA Latreille 1806
Subclass HOPLOCARIDA Calman 1904
Order AESCHRONECTIDA Schram 1969
Family AENIGMACARIDIDAE Schram and Horner 1978
Genus *JOANELLIA* Schram 1979

Diagnosis.—Small aenigmacarid. Carapace subtrapezoidal in lateral outline. Second pleomere longer than any of the other first 5 pleomeres. Uropods terminal on 6th pleomere and directed posteriorly (probably flap-like).

Range.—Dinantian (Viséan) to Middle Namurian (Upper Mississippian).

Remarks.—The genus *Joanellia* was described by Schram (1979) based on Viséan material from Scotland and northern England. Schram and Horner (1978) suggested allying *Joanellia* with the genus *Aenigmacaris.* This assignment was based on both genera having very elongate and poorly sclerotized tailfans, and stenopodous pleopods.

JOANELLIA LUNDI sp. nov.

Figs. 1 and 2, Table 1

Diagnosis.—Carapace subtrapezoidal with short rounded branchiostegal lobes. Cuticle poorly sclerotized. Abdominal pleurites 1 through 4 with posterior extension and triangular ventral margins.

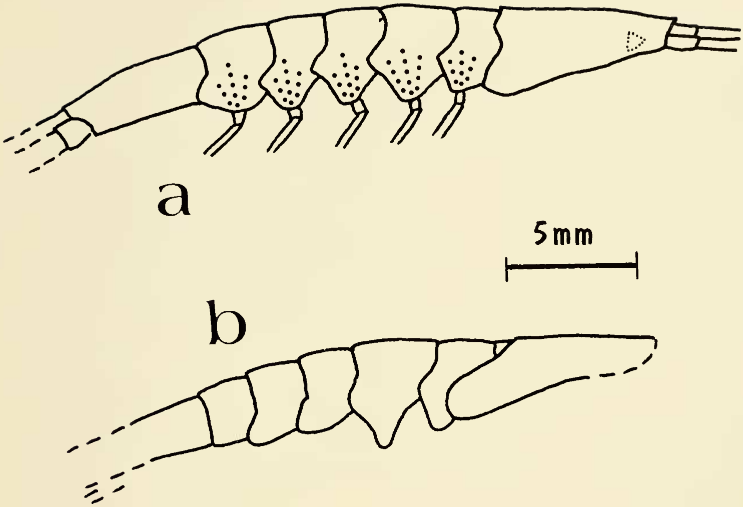

Fig. 2. ***Joanellia lundi*** sp. nov. from the Heath Shale, Upper Mississippian, Montana (dots indicate location of mandible and pleopod muscles). (B) *Joanellia elegans* (Peach) 1908, Dinantian, Lower Carboniferous, Great Britain.

Holotype.—PE 18383 (Fig. 1a).

Type locality.—As described in the introduction (collected specimens not separated as to locality).

Derivation of name.—Named in honor of Dr. Richard Lund, the collector of the material, who over the years has generously made this and other Paleozoic crustacean material available to us for study.

Description.—The entire cuticle of the animal is poorly sclerotized. The carapace has a blunt anterior end with a faint optic notch (PE 18383, Fig. 1a, CM 33893). The posterior carapace margin is gently curved or bowed anteriad and the branchiostegal lobe is rounded (PE 18384, CM 33898). Only the proximal segments of antennae have been preserved, and several specimens (e.g., PE 18383, Fig. 1a, PE 18384, CM 33893) reveal the proximal segment was moderate in size and the next most distal segments were of longer but undetermined length. The mandible (PE 18383, 18384) is relatively large but apparently not highly sclerotized nor mineralized.

The first 4 pleomeres are all similar, except for the 2nd being larger than any of the others (PE 18384, Fig. 1c). The first 4 abdominal segments have triangular ventral margins and a posteriorly directed extension on the pleuron (PE 18317, 18384, Fig. 1c). The 5th pleomere pleura is broadly rounded (PE 18375). Pleomeres 1 through 5 have stenopodous pleopods (PE 18323, 18375, 18382, Fig. 1b), with only the proximal short segments, and part of the long, next most distal segment being preserved.

Table 1. Measurements (in millimetres) for some specimens of ***Joanellia lundi*** sp. nov. * denotes the holotype.

Specimen	Carapace length	Abdominal length (pleomeres 1–6)
PE 18317	3.7	7.5
PE 18373		7.3
PE 18380		11.0
PE 18382		9.4
PE 18383*	4.1	7.4
PE 18384	3.2	
CM 33893		7.8

These 5 pleopods were also equipped with a well-developed musculature (PE 18308, 18309a, 18371, 18373, Fig. 1d, 18380, 18383) which took origin on the sides of the abdominal segments. The 6th pleomere is very long (PE 18380). The uropods are apparently flap-like, situated terminally, and directed markedly posteriad (PE 18314, 18383), but further details of their exact form are obscure. Nothing can be discerned concerning the telson.

A partial reconstruction is presented in Fig. 2a.

Remarks.—Because the cuticle was so poorly sclerotized the specimens of *Joanellia lundi* are poorly preserved. As a result really pertinent descriptive features of the antennae, thoracopods, and tailfan are lacking.

Several differences of *Joanellia lundi* with *Joanellia elegans* (Fig. 2b) of the Scottish Viséan can be delineated. *Joanellia elegans* has a sharp posterior extension to the branchiostegite lobe of the carapace, no marked posterior extensions on the abdominal pleura, only pleomere pleura 1 and 2 with triangular ventral margins, and pleomere pleura 3 through 5 broadly rounded.

Some representative measures of *Joanellia lundi* are given in Table 1.

ACKNOWLEDGMENTS

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